An Essay on

Tetanus.

Respectfully Submitted

To the Faculty

of the

Homœopathic Medical College of Pa.

For the Degree of Doctor of Medicine

BY

Thomas F. Sumner.

Of Stoughton Mass.

Philadelphia — Feb. 1st 1863.

Tetanus

Definition. — Tetanus is a disease consisting essentially in an excited state of the spinal cord and the medulla oblongata, in fact of the true spinal system, giving rise to painful and continued spasms affecting the muscles of the face, diaphragm trunk, and limbs, of all the muscles, indeed, supplied by the cerebro spinal nerves, in its progress, perhaps, involving all the muscular tissues of the body. These spasms or muscular contractions are enduring and rigid, yet mingled with occasional and more intense contractions, of transient and convulsive violence, There is also

a "permanent exaltation of the reflex function", in consequence of which every stimulus acquires a morbid influence in exciting such convulsions", alternating with incomplete relaxation and usually terminating fatally. This, which is one of the most serious and distressing to which the nervous system is liable, in great majority of instances, of a traumatic nature, being the consequence of some wound that implicates or irritates a portion of the peripheral nervous system, the local irritation so produced, being propagated to, and exciting the nervous centres, the excitation of which becomes persistent, and continues after the local cause

has been removed, inducing reflex muscular movements in various parts of the body. The irritation of the nervous system, however, that induces tetanus, may arise from other sources besides surgical wounds, occasioning the idiopathic form of the disease, thus, for instance, the presence of worms in the intestinal canal, exposure to cold and wet, and even the uterine irritation following abortion, have been known to occasion it. These causes rarely give rise to it in this country, and we must regard it as a disease chiefly arising from traumatic lesion of some kind.

Division.— (1.) It is divided into the idiopathic,

or that which arises from some disorder of the blood or nervous system without wound, and the traumatic, or that which is caused by a wound. (2.) It may be acute or chronic. (3.) It may be general or partial; and when partial it is mostly confined to the neck and jaws, constituting trismus, or locked jaw. (4.) It is called opisthotonos when the body is curved backwards, as it most commonly is; emprosthotonos, when it is curved foward; and pleurosthotonos, when it is drawn to one side, this being the most uncommon. (5.) The trismus nascentium or infantum which attacks children soon after birth is usually made a

distinct species. (6.) Tetanus may in its type be intermittent, when it is caused by marsh miasmata, as it may be occasionally, like almost every other affection. (7.) Lastly there is the hysterical tetanus; in which all the outward symptoms of tetanus are produced, as a consequence of an hysterical state of the system. 7. Tetanus may be occasioned by injuries that do not give rise to breaks of surface, thus it has been known to occur in a child who was suddenly thrown down upon its back by another at play; and Dr. Reid mentions a case produced by the stroke of a whip. But certainly in the great majority of cases, it is directly

occasioned by a wound of some kind, and then it will generally be found that a nervous twig has been lacerated, divided or inflammed, thus in a case of tetanus following a wound of the knee, in a patient, who died in University College Hospital, a small branch, of the internal cutaneous nerve was found to have been injured and inflammed; and in another patient who died of tetanus about fifteen days after treading on a rusty nail, a black speck was found in the internal plantar nerve, where it had been wounded by the nail. In another case in which resulted from a bruise of the back, and

terminated in death, the injured nerve (a dorsal branch) was found lying bare and reddened in the wound, and on tracing it up to the spinal cord, its sheath was found to be much injured, ecchymosed, and with a large vessel running down it.

The kind of wound, as well as its situation, doubtlessly influences materially the occurence of the disease. Though it more frequently follows punctured, torn, and lacerated, than clean cut wounds, yet it occasionally complicates these, even when the result of surgical operations; thus it has been known to follow the removal of the breast, amputations, the ligature of the arteries, and

the operation for hernia. It is the common belief both in the profession and out of it, that wounds of the hands and feet, and more especially of the ball of the thumb and of the great toe, are more likely to be followed by tetanus than those of other situations. I think the truth of this opinion may be doubted; though it is not improbable that tetanus may occur more frequently after injuries of these regions, simply because punctured and lacerated wounds are more common here than elsewhere. It cannot well be supposed to be owing to the tendons and fascia that abound here, as it is seldom, if ever met with after operations for tenotomy which

are so commonly practiced on the feet.

Tetanus is especially apt to occur in feeble and debilitated individuals, and, indeed, may be looked upon as a disease of debility, hence any condition that lowers the tone of the nervous system is likely to occasion it. Thus in unhealthy tropical climates, as in some of the West Indies Islands, and amongst the marshes of Cayenne, it is said to occur with peculiar frequency, the most trifling scratches or punctures being followed by the disease. The exposure also of the wounded on the field of battle to cold, and wet night air, is especially liable to occasion it. Thus after the battles of Bautzen, where the wounded were left on the field, during night exposed to

severe cold. Larry found on the following morning that more than one hundred were affected with tetanus. It may occur in all ages, but I believe is most frequently met with at the early and advanced periods of life. It is at least most commonly seen either in very young or in old people; most frequently, certainly, in the young. In this country it rarely occurs amongst infants, but in hot climates it is said not unfrequent to be met with shortly after birth, from irritation occasioned by the ligature of the umbilical cord. Tetanus at times appears to occur epidemically. No case may occur in a hospital for a year or two, and then several will appear at or about the same time.

Tetanus may take place at any time after the infliction of the wound that occasions it. In hot climates especially it may occur very speedily; thus, Dr. Robinson relates a case of a negro servant in the West Indies, who scratched his finger with a broken plate, and died of tetanus in a quarter of an hour. It is very seldom, however, in temperate climates, that it supervenes before the fourth or fifth day. Larry, whose great experience of this disease during Napoleons campaign in Egypt, met with it most frequently between the fifth and fifteenth days after the infliction of the wound. According to the experience of the surgeons of the Peninsular War, under whose

observation many hundreds of cases came, the disease does not show itself after the twenty-second day; but though this may be the general rule, Sir G. Blane has related a case in which it took place as late as a month after the infliction of the wound. It is stated that it may occur after the cicatrization of a wound is completed; when this happens the disease must rather be looked upon as being of an idiopathic character accidentally occuring in a person who has been recently injured. Tetanus may be acute or chronic, being in some instances fatal in the course of a few hours, but usually for several days. If the patient survive this time, the

disease will commonly run on to the eighth or tenth day, and occasionly even for a longer period than this; thus S. Cooper mentions a case in which it continued in a soldier for five weeks after amputation. As a general rule the more acute the case, the more dangerous is the disease. In chronic cases there is a good hope of the patients recovery.

Symptoms. — When the disease sets in gradually, it may be somewhat difficult of recognition, in its early stages, if it comes on suddenly, its nature is immediately evident. The patient first complains of stiffness and pain of the neck and jaws as from a cold; his

voice is husky; it is difficult for him to put out his tongue, and his countenance is observed to have a peculiar expression, resembling a painful smile, because the corners of the mouth and eyes are drawn outwards by incipient spasm of the facial muscles. In the next place, the muscles of mastication and deglutition become fixed and rigid with spasm, so that the mouth is permanently closed, and there is great difficulty of swallowing especially liquids. To these symptoms succeed a fixed pain at the pit of the stomach shooting to the back, and a convulsive difficulty of breathing, indicating that the diaphragm and muscles of the glottis are affected, and

the spasm now extends to the muscles of the trunk and limbs, rendering them completely fixed and rigid. The abdomen feels remarkably hard; there is obstinate constipation, and frequently difficult micturition from spasm of the perineal muscles; the pupils are contracted; and the saliva flows from the mouth, because the patient is unable to swallow it. This spasm never ceases entirely; but it occasionally has a lull, and then comes on again in fits of greater violence. Such fits are easily brought on by any disturbance, such as an attempt to swallow, or by any other bodily movement or mental excitement, and most remarkably by slight causes affecting

the surface of the skin; such as currents of cold air. There are generally some snatches of relaxation during sleep. It is said that in severe cases the spasms have been of so violent a character that the muscles have been ruptured, teeth broken, and tongue lacerated. The intellectual faculties are not disturbed in these cases, and the mind continues to the last. In most instances there is a good deal of heat of surface, and quickness of pulse, not from any febrile disturbance, for this disease is unattended by symptoms of pyrexia, but apparently from violence of the muscular contractions. The prolongation of life appears to depend greatly upon

the intensity of the convulsive movements: the more severe these are, the sooner does death result. The fatal termination occurs not so much from any great physical lesion, or disturbance of important parts, as from exhaustion, consequent on the frequency of the tetanic spasm.

Diagnosis.— Tetanus may be distinguished from hydrophobia by the spasms being continuous, and by the patient being in general sensible, and calm to the last; whereas in hydrophobia, there are fits of general convulsions with perfect intermissions, and the patient is mostly délirious. Inflammation of the spinal cord, or of its membranes, may be

distinguished by the pain in the back and fever, and by the paraplegia and coma which supervene in most cases

Prognosis.— The prognosis in acute tetanus is extremely unfavorable, especially if traumatic; it is more favorable in the idiopathic form, and the chronic generally gets well of itself. Death very seldom occurs after the twelfth day. As a general rule, it may be said that the prognosis is favorable if the complaint is partial;— if it does not affect the muscles of the glottis;— if it has lasted some days without increasing in severity;— if it is sensibly mitigated by the remidies employed;— if the pulse is not much accelerated

;— if the patient sleeps;— and if he has been subject to it before in an intermittant form. On the other hand, the prospect will be unfavorable, if the spasms continually increase in severity, and especially if they affect the muscles of the glottis.

Causes.— Tetanus may be caused by wounds and external injuries of every discription, but especially by lacerated and punctured wounds of the hands and feet, gunshot wounds, compound fractures, compound dislocation of the thumb, and wounds irritated by foreign matters, or in which nerves are exposed. Dr. Morgan knew it even caused by a blow with a schoolmasters ferule; but it is very rarely

caused by simple incisions. The period at which it may come on after an injury, is very uncertain. Sometimes it occurs very quickly, if the patient is predisposed to it. Sometimes it seems to be induced by the great pain and irritation of a wound during its inflammatory state: but the most common period is, when the wound is nearly healed.

It is probable, however, that in most instances some concurrent or predisposing cause, in addition to an external injury, is required to produce tetanus. Of such causes, the best established are, 1st, an irritated state of the gastro-intestinal mucous membrane; and, 2dly, exposure to cold damp night air during

warm weather, or in a warm climate; consequently, tetanus is much more prevalent and fatal in warm than in cold or temperate climates.

The same causes, cold and visceral irritation, namely, which predispose to the traumatic, may of themselves produce the idiopathic tetanus. Thus the latter may be a consequence of various visceral irritations, especially of the womb.

Whytt gives the case of a girl, aged twenty, who caught cold during the menstrual period, and died of tetanus in eighteen hours; and the author knows a case in which fatal trismus followed uterine irritation, consequent on abortion.

Tetanus may also be caused by certain

poisons, especially the nux vomica.

Pathology. — The spasms of tetanus affecting as they do all the voluntary muscles, must evidently depend on some morbid condition of that central organ, the spinal cord and medulla oblongata, from which all the voluntary muscles are supplied with nerves. What that condition is, is unknown. It may be dependent on a peculiar state of the blood. inasmuch as we know that when blood containing strychnine circulates through the nerve centres, it causes tetanic symptoms. Or it may depend on some disturbance in nervous action, independently of the blood, of which we are profoundly ignorant. Such nervous disturbance may be centric, that

is, may depend on causes affecting the spinal marrow itself; or eccentric, that is to say, may depend on irritation of some other part of the body, which irritation is conveyed to the spinal cord by the sentient or afferent, or, in Dr. Hall's language, excito motor nerves.

It is quite certain that the morbid condition cannot be regarded as inflammatory in the ordinary sense of the word, because the spinal cord is often found after death without a trace of vascularity, and because tetanus may be established during a state of depression and collapse that would be quite incompatable with inflammation

Although, however, it is most certain that

inflammation is not essential to the existence of tetanus, still it is equally certain that there is one class of tetanic cases which presents a well marked inflammatory character. They commence with shivering and pain, are attended with fever, and if fatal, display on inspection, congestion, serous effusion, softening or purulent deposit, in some part of the brain or spinal cord. But this class is a small one.

Morbid Anatomy.— The morbid appearances that have been found in different cases are as follows.— Increased vascularity of the membranes and substance of the spinal cord, with or without effusion of serum?;— more rarely the same

appearances may be found in the cranium; flakes of cartilage and spicula of bone deposited in the membranes of the spinal cord; — vascularity of the nerves leading from the wounded part; — of the mucous membrane of the stomach; and of the sympathetic ganglia; — and congestion of the lungs. But there is not one of the morbid changes that is constantly, and except the first, there is not one of them that is even frequently found. The muscles are extremely rigid after death, and ecchymosed or ruptured in many parts; — the blood is mostly uncoagulated.

Termination. — (1.) If the case is about to terminate fatally, the paroxysms become more frequent and violent, and the breathing more and more

embairassed by spasm of the diaphragm and of the muscles of the glottis; and at last the patient dies, either from exhaustion or from sufforcation; either because the nervous system is worn out by the violence of the spasm; or because the respiration is suspended long enough to cut off the necessary supply of arterial blood from the brain, and so to induce insensibility. The most usual period of death is the third or fourth day; sometimes it is postponed till the eighth or tenth, but rarely later. On the other hand, there is the case of a negro who injured his hand and died of tetanus in a quarter of an hour; and cases of death within twenty four hours are by no means uncommon

(2.) When acute tetanus terminates favorably, still the patients recovery may not be complete for weeks or months; partly because of the strainings and lacerations which muscles have suffered, — partly because of the remaining tendency to spasm, which very slowly yields and is apt to be temporarily aggravated by very slight causes, especially cold and damp. But in some rare instances the disease has been removed almost instantaneously by the removal of its exciting cause.

Treatment. — Arsenicum. — Tetanic spasms, convulsions, with frightful contortion of the limbs, or else the convulsions may be excited by violent pains in the bottom of the

feet. Drawing pressure in the teeth, violent lacerating in the teeth.

Belladonna. — Tetanic spasms, opisthotonos, spasmodic inclination of the body and head to the left side; paroxysms of stiffness and immobility of the limbs, or of single limbs only. Lock jaw accompanied by convulsions in all the limbs, and chilliness. Stiches and tension of the jaw, in the direction of the ear. Excessive pain when biting, Swelling of the cervical glands, painful at night, not painful during deglutition. Cramp like tensive sensation of the left cervical muscles, even during rest. Grinding of the teeth, with

A foam at the mouth, smelling like rotten eggs. Spasm of the right arm. Painful swelling of the right side of the gums, with fever and sensation of chilliness.

Brucia. — Lock jaw, the lips being quite open, and the entire teeth exposed. Grinding of the teeth. Sweat on the forehead and the face after the paroxysm of spasm. Gnawing, tearing pains in all the teeth, and gums, aggravated by cold. Spasmodic closure of the mouth, causing an inability to speak. Violent jerking along the spinal column, particularly along the lower portion, as if occasioned by electric shocks, with slight raising of the back. Violent opisthotonos.

Bryonia.— Pain of a molar tooth, when, when masticating, excessive pain during rest, particular when in bed, toothache on introducing any thing warm into the mouth, toothache occasioned by the contact of the air. Darting & flashing pain in the teeth, in the direction of the ear, obliging one to lie down. Sanciation extending into the cervical muscles when eating, and aggravated by mouth. Hard swelling in the hypochondriac and around the umbilicus.

Camphor.— Lock jaw. Toothache, shooting, cutting thrusts darts along the gums near the roots of the incisors and cuspidati, Bruised feeling in the abdomen. Pinching pains in the umbilical region. Aching in

the hypochondria. Abdominal spasms.

Canthais. — Violent tetanic convulsions, the convulsions abate periodically, but soon reappear; either as emprosthotonos, or opisthotonos, accompanied with violent trismus, violent grinding of the teeth, and discharge of a frothy and sometimes blood streaked with saliva, inability to swallow and convulsive constrictions of the larynx at every attempt to swallow; expression of terror and despair in the face; the hair standing on end during the convulsions; staring look, sparkling, fiery, frightfully and convulsively rolling eyes; natural temperature of the skin, with full and slow pulse, contraction of abdominal muscles when making pressure

with the hands upon the umbilical region; the abdominal muscles particularly the recti muscles are drawn in, streched like the strings of an instrument, and seem to adhere to the spinal column. Bloatedness of the face, swelling of the right side with tension, also without redness and heat. Lacerating in the right mastoid process, lacerating in the lower jaw.

Cicuta Virosa. — Lock jaw with the teeths pressing firmly against one another. Foam in and at the mouth. Aching pains in the nerves of the lower row of teeths. Dumbness. Inability to swallow. The throat appears to be closed, and feels bruised externally when touching it. Opisthotonos. Painful sensation on the inner surface of

the scapulæ. Cramps in the cervical muscles.
Swelling of the neck.

Cuprum Metallicum. — Opisthotonos, with the limbs spread out to the sides, and the mouth open. Spasms of the limbs. The limbs and trunk become rigid, the jaws closed. Or with loss of consciousness, opisthotonos, redness of the eyes, ptyalism and frequent micturition, Spasmodic contraction of the jaws. Lancinating, lacerating, in the cervical muscles. Swelling of the right cervical glands, painful to the touch.

Ignatia. — Convulsions; tetanus; shuddering with thirst, followed by heat without thirst; partial chill, changing from one part of the body to another; spasmodic twitching of the

facial muscles, contraction of the masseter muscles.

Ipecacuanha. — Convulsive movements of the facial muscles. The body of the child is stretched stiff. Rigid stretching of the whole body, followed by a spasmodic jerking of the arms towards one another. Pain in the teeth as if they would be torn out in paroxysms. Spasmodic contractive sensation in the throat and in the chest. Opisthotonos and emprosthotonos.

Lachesis. — Stiffness of the articulations of the jaws. Lock jaw with chillines. Lock jaw in a patient affected with chronic catalepsy. Lacerating in the jaws, lacerating in the teeth also with furious darting and stinging in the roots of the lower teeth.

Laurocerasus. — Convulsions, with subsequent paralysis of the muscles. Convulsions, with twitchings about the head, and in the dorsal and in the cervical muscles, which soon become paralyzed, Convulsions with staring eyes, lock jaw, foam at the mouth. Slight convulsions. Spasms of the back. Tetanic spasms, also in general, Convulsions of the facial muscles. Prosopalgia. Bruised pain in the whole lower jaw in the evening. Sensations as if jaw would become dislocated.

Nux Vomica. — Violent convulsions during which the whole body becomes rigid. Painful tetanic convulsions, leaving the limbs stiff, occasional tetanic convulsions in the paralyzed limbs,

alternating with violent concussions. Tetanic spasms affecting even the muscles of the chest and occasioning a gradually increasing dyspnoea. Tetanus alternating with asphyxia and paralytic relaxation of the parts. Frightful spasms of the whole body every three or six minutes, a real tetanic spasm, with bending of the body backwards, drawing in of the muscles of the chest, loss of consciousness, stiffness of the limbs, hardness of the muscles, as if made of wood, distortion of the eyes, cherry redness of the face, Sudden falling without loss of consciousness, pale completion, indifferent expression of countenance, anguish, alternation of laughing and crying, widely opened eyes, contraction

of the pupils, unequal, superficial breathing, irregular small pulse, cool skin, with fore arms half bent, whilst the hands and fingers were convulsively moved, with immobility and stiffness of the limbs, and continued hardness and contractions of the muscles of those limbs, Violent convulsions, with subsequent stiffness and stupefaction of all the senses. Tetanus. Alternate opisthotonos and risus, Asphyxic condition. Lock jaw; with perfect consciousness. Drawing lacerating pain in the jaws.

Opisthotonos. — Fainting, with spasms of the back. Loss of sensibility, as if dead, also with lock jaw. Loss of sight and hearing,

with inability to swallow. Insensibility and prostration, with vomiting. Rigidity of the body like that of a corpse, with loss of muscular power and vanishing of the senses and pulse. Trembling of the whole body. Distortion of the limbs and subsultus tendinum. Complete rigidity with entire conciousness. Distortion and twitchings of the facial muscles.

Opium. — Convulsions and spasmodic motions, with foam at the mouth. Convulsions, with cries. Convulsions, with sleep, after the paroxysms. Convulsions in the evening or towards midnight, with drowsiness, clenched fists, and involuntary motions of the hands and head. Tetanic spasms with rigidity of

the back or the whole body. Rigidity of the whole body. Epileptic convulsions with tetanus. Spasmodic movements of the facial muscles. Convulsive trembling of the facial muscles, lips and tongue. Distortion of the mouth. Lock jaw. Violent pains in the lower jaw. Pains in the upper jaw. Drawing, lacerating in the back. Convulsive movements to and fro in the arms. Plumbum aceticum. — Convulsions of single limbs. Slight convulsions. Violent convulsions. Spasmodic movements. General convulsions. Convulsions with frightful shrieks, alternating with pain in the bowels. Epilepsy. Opisthotonus.

My frightful neuralgia. Excessive emaciation. Cadaverous complexion. Boring in the jaw and teeth. Lock jaw.